

## CLAIMS

We claim:

1 1. A method for filling a polygon with a minimum number of  
2 rectangles, comprising the steps of:

3 bordering said polygon, including:

4 selecting a starting border width; and

5 merging border segments where possible; and then

6 orthogonally filling.

1 2. A method for filling an original polygon envelope with  
2 a minimum number of stripes, comprising the steps of:

3 creating a border polygon;

4 generating orthogonal fill stripes; and

5 processing uncovered areas.

1 3. The method of claim 2, further comprising the step of:

2 receiving input parameters, said input parameters  
3 including parameters defining a minimum stripe width, a  
4 maximum stripe width, and a merge adjacent borders  
5 flag.

1 4. The method of claim 2, said input parameters further  
2 including stripe overlap amount.

1 5. The method of claim 3, said input parameters further  
2 including wire with ends size delta, and maximum number of  
3 borders.

1 6. The method of claim 3, said step of creating a border  
2 polygon further comprising the steps of:

3 calculating a maximum current polygon border width

4 parameter for a current polygon;

5 responsive to said maximum current polygon border width  
6 parameter, calculating a border width parameter for a  
7 current border;

8 creating a border polygon with a width equal to said  
9 border width parameter;

10 responsive to said merge adjacent borders flag being  
11 enabled, creating a new border including merging said  
12 current border with a previous border if possible;

13 responsive to said new border from said merging step,  
14 creating a new fill polygon;

15 creating a least encompassing rectangle for said new  
16 fill polygon;

17 responsive to said least encompassing rectangle being  
18 contained entirely within said original polygon  
19 envelope, ending said step of creating a border polygon  
20 and passing any uncovered area within said new fill  
21 polygon to said generating step; otherwise, returning

22 to said step for calculating width to process said new  
23 fill polygon as said current polygon.

1 7. The method of claim 6, said step for calculating a  
2 maximum current polygon border width further comprising the  
3 steps of:

4 adjusting said maximum stripe width input parameter to  
5 a new upper limit which reflects characteristics of  
6 said current polygon as well as any previous border  
7 polygons.

1 8. The method of claim 7, said adjusting step further  
2 comprising the steps of:

3 calculating the length of each side of said current  
4 polygon;

5 deriving a smallest side length parameter equal to the  
6 larger of (1) a first factor times said minimum stripe  
7 width or (2) the length of the shortest side obtained  
8 from said step for calculating length;

9 setting said smallest side length parameter from said  
 10 deriving step to a reduced amount by a second factor;  
 11 if said current polygon is an inner border and said  
 12 smallest side length parameter is less than the  
 13 previous border width, setting said smallest side  
 14 length equal to said previous border width;  
 15 if said smallest side length parameter is greater than  
 16 said maximum stripe width parameter, setting said  
 17 smallest side length parameter equal to said maximum  
 18 strip width parameter; and  
 19 returning said smallest side length parameter for  
 20 processing as said maximum current polygon border width  
 21 parameter.

1 9. The method of claim 8, said step for calculating a  
 2 border width for a current border further comprising the  
 3 steps of:

4 responsive to said minimum stripe width parameter and  
 5 said maximum current polygon border width parameter,

6 deriving a border width variable selectively operable  
7 for determining that said current polygon is impossible  
8 to be bordered or that said generating orthogonal fill  
9 stripe step be executed.

1 10. The method of claim 9, said step for deriving a border  
2 width variable further comprising the steps of:

3 initializing said border width variable equal to said  
4 maximum current polygon border width parameter;

5 rounding said border width variable;

6 if said border width variable exceeds said maximum  
7 stripe width parameter, setting said border width  
8 variable equal to said maximum stripe width parameter;

9 iteratively shrinking and expanding said current  
10 polygon with a shrink value equal to said border width  
11 variable;

12 if said shrinking step causes said current polygon to  
13 shrink to nothing, then indicating a solution is not

14 possible;

15 if said shrinking and expanding steps create a new  
 16 polygon which completely covers said current polygon,  
 17 then terminating said iteratively shrinking and  
 18 expanding steps and returning said border width  
 19 variable for use in subsequent processing; and

20 if said shrinking and expanding steps create a polygon  
 21 which does not cover said current polygon, then  
 22 returning said minimum strip width parameter for use as  
 23 said border width variable in subsequent processing.

1 11. The method of claim 6, said step for generating  
 2 orthogonal fill stripes, further comprising the steps of:

3 analyzing areas to be filled to determine optimal  
 4 stripe direction; and

5 iteratively generating fill stripes in said optimal  
 6 stripe direction to fill said areas to be filled.

1 12. The method of claim 6, said step for processing  
 2 uncovered areas further comprising the steps of:  
 3 locating all uncovered polygon areas by subtracting the  
 4 union of all existing fill shapes from said original  
 5 polygon envelope; and

6 iteratively process each said uncovered polygon area,  
 7 selectively bordering and orthogonally filling those  
 8 uncovered polygon areas which are exterior polygons,  
 9 and filling with a single rectangle uncovered polygon  
 10 areas which are interior polygons.

1 13. The method of claim 8, said first factor being 3 and  
 2 said second factor being 0.8.

1 14. An artwork generating system, comprising:  
 2 an exposure tool for exposing a glass master to a  
 3 polygon envelop as a plurality of polygon fill stripes;  
 4 a polygon fill control module defining an optimum set



5 of said polygon fill stripes for filling said polygon  
6 envelope, said control module being operable for

7 generating a first plurality of fill stripes  
8 comprising a plurality of border polygons;

9 generating zero to a plurality of orthogonal fill  
10 stripes; and

11 generating zero to a plurality of fill stripes for  
12 processing uncovered areas.

1 15. A method for filling an original polygon envelope with  
2 a minimum number of stripes, comprising the steps of:

3 generating a first plurality of stripes for creating a  
4 border polygon;

5 generating a second plurality zero or more stripes  
6 comprising orthogonal fill stripes; and

7 generating a third plurality of zero or more stripes  
8 for processing uncovered areas.

1 16. A system for filling an original polygon envelope with  
2 a minimum number of stripes, comprising:

3 means for generating a first plurality of stripes for  
4 creating a border polygon;

5 means for generating a second plurality of zero or more  
6 stripes comprising orthogonal fill stripes; and

7 means for generating a third plurality of zero or more  
8 stripes for processing uncovered areas.

1 17. A program storage device readable by a machine,  
2 tangibly embodying a program of instructions executable by a  
3 machine to perform method steps for filling an original  
4 polygon envelope with a minimum number of stripes, said  
5 method steps comprising:

6 generating a first plurality of stripes for creating a  
7 border polygon;

8 generating a second plurality of zero or more stripes  
 9 comprising orthogonal fill stripes; and  
 10 generating a third plurality of zero or more stripes  
 11 for processing uncovered areas.

1 18. An article of manufacture comprising:

2 a computer useable medium having computer readable  
 3 program code means embodied therein for filling an  
 4 original polygon envelope with a minimum number of  
 5 stripes, the computer readable program means in said  
 6 article of manufacture comprising:

7 computer readable program code means for causing a  
 8 computer to effect generating a first plurality of  
 9 stripes for creating a border polygon;

10 computer readable program code means for causing a  
 11 computer to effect generating a second plurality of  
 12 zero or more stripes comprising orthogonal fill  
 13 stripes; and

14 computer readable program code means for causing a  
15 computer to effect generating a third plurality of zero  
16 or more stripes for processing uncovered areas.

1 19. A computer program product or computer program element  
2 for filling an original polygon envelope with a minimum  
3 number of stripes, according to the steps of:

4 generating a first plurality of stripes for creating at  
5 least one border polygon;

6 generating a second plurality of zero or more stripes  
7 comprising orthogonal fill stripes; and

8 generating a third plurality of zero or more stripes  
9 for processing uncovered areas.

1 20. A program storage device readable by a machine,  
2 tangibly embodying a program of instructions executable by a  
3 machine to perform method steps for filling an original  
4 polygon envelope with a minimum number of stripes, said  
5 method steps comprising:

6 receiving input parameters, said input parameters  
7 including parameters defining a minimum stripe width, a  
8 maximum stripe width, and a merge adjacent borders  
9 flag;

10 first generating a first plurality of stripes for  
11 creating at least one border polygon;

12 second generating a second plurality of zero or more  
13 stripes comprising orthogonal fill stripes; and

14 third generating a third plurality of zero or more  
15 stripes for processing uncovered areas;

16 said first generating step including the steps of:

17

18 calculating a maximum current polygon border width  
19 parameter for a current polygon;

20 responsive to said maximum current polygon border  
21 width parameter, calculating a border width  
22 parameter for a current border;

23 creating a border polygon with a width equal to  
 24 said border width parameter;

25 responsive to said merge adjacent borders flag  
 26 being enabled, creating a new border including  
 27 merging said current border with a previous border  
 28 if possible;

29 responsive to said new border from said merging  
 30 step, creating a new fill polygon;

31 creating a least encompassing rectangle for said  
 32 new fill polygon; and

33 responsive to said least encompassing rectangle  
 34 being contained entirely within said original  
 35 polygon envelope, ending said step of creating a  
 36 border polygon and passing any uncovered area  
 37 within said new fill polygon to said step for  
 38 generating step a second plurality of zero or ;  
 39 otherwise, returning to said step for calculating  
 40 width to process said new fill polygon as said  
 41 current polygon.

1 21. A system for filling an original polygon envelope with  
2 a minimum number of stripes, said method steps comprising:  
  
3 receiving means for receiving input parameters, said  
4 input parameters including parameters defining a  
5 minimum stripe width, a maximum stripe width, and a  
6 merge adjacent borders flag;  
  
7 first generating means for generating a first plurality  
8 of stripes for creating at least one border polygon;  
  
9 second generating means for generating a second  
10 plurality of zero or more stripes comprising orthogonal  
11 fill stripes; and  
  
12 third generating means for generating a third plurality  
13 of zero or more stripes for processing uncovered areas;

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